



Technical Memorandum No. 3: Traffic Analysis

Abstract

This technical memorandum documents the results of the traffic analysis that was completed for alternative roadway systems being evaluated for the SR 504 Feasibility Study. This technical memorandum is to be used as a planning tool in addressing the feasibility of extending Spirit Lake Memorial Highway, SR 504, to state and federal roads on the northern/northeastern, eastern, or southern sides of Mount St. Helens National Volcanic Monument.

Existing Conditions

Transportation System Characteristics

The Mount St. Helens National Volcanic Monument is located in a rural area of southern Washington approximately 50 miles east of Interstate 5 (I-5) at the eastern terminus of SR 504. Direct access to the National Monument is provided from the west by SR 504 and from the east by National Forest Road (NF) 99. Access to attractions on the south side of the monument is possible via SR 503. Connecting roadways to the areas surrounding the National Monument include U.S. 12 to the north, NF 25 to the east, and NF 90 and NF 81 to the south. Figure 1 provides a general vicinity map and an illustration of the corridors that will be evaluated in this analysis. The following provides a brief description of the transportation facilities that provide access to the National Monument and the surrounding areas.

U.S. 12

U.S. 12, located north of Mount St. Helens National Volcanic Monument, forms the northern boundary of the study area. U.S. 12, which is under the jurisdiction of the Washington State Department of Transportation (WSDOT), is an east/west two-lane highway with standard shoulders and a posted speed limit of 55 miles per hour (mph). Because of the rural characteristics of the area, most intersecting roadways with U.S. 12 are under STOP sign control. The I-5/U.S. 12 interchange is a modified diamond interchange with the southbound ramp from I-5 onto U.S. 12 configured as a loop ramp. The ramp terminals on U.S. 12 at the I-5 interchange are under STOP sign control.

SR 504

SR 504 is a two-lane east/west highway under the jurisdiction of WSDOT with standard shoulders. The predominant speed limit on SR 504 is 50 mph, although the speed limit decreases near the route terminus due to the horizontal and vertical alignment. SR 504 traverses through mountainous terrain and provides many pull-outs and climbing lanes. SR 504 is 51.81 miles in length and terminates at the Johnston Ridge Volcanic Observatory at Mount St. Helens National Volcanic Monument. At milepost 44.37, SR 504 enters the monument boundary. The I-5/SR 504 interchange is a diamond type interchange with traffic signals at the ramp terminals. The intersection of SR 504 and Old Pacific Highway is also signalized. Roadways intersecting with SR 504 are under STOP sign control.

SR 503

SR 503, which is under the jurisdiction of WSDOT, begins in the City of Vancouver and follows a north/south alignment through the City of Battle Ground to milepost 31.31 near Yale. From that point, SR 503 begins an east/west alignment and continues to its terminus at I-5 in the City of Woodland at milepost 54.38. The speed limit on SR 503 is predominantly 50 mph, although there are some segments that are 55 mph. The speed limit is reduced in the urban areas near the cities of Battle Ground and Woodland. SR 503 is a two-lane highway in the rural areas but widens to a three- or four-lane highway in the urban areas. The ramp terminals at the I-5/SR 503 interchange are signalized.

SR 131

SR131 is a two-lane north/south roadway under WSDOT jurisdiction with partial width shoulders and posted speed limits of both 35 and 50 mph. SR 131 is approximately two miles in length and connects NF 25 with U.S. 12 near Randle.

NF 25 and NF 81

NF 25 and NF 81 are two-lane north/south roadways under the jurisdiction of the U.S. Forest Service (USFS). Although these facilities are paved roadways, they are lower speed facilities with many sharp curves and switchbacks and narrow shoulders. NF 25 joins SR 131, which connects with U.S. 12 to the north, and intersects with NF 90 to the south. NF 81 extends north from Cougar at SR 503 and terminates near the Mount St. Helens National Volcanic Monument boundary.

NF 90 and NF 99

NF 90 and NF 99 are two-lane east/west roadways under the jurisdiction of the USFS. As with NF 25, these roadways have lower design speeds with many sharp curves and narrow shoulders.

NF 26

NF 26 is a one-lane north/south roadway under the jurisdiction of the USFS that connects NF 25 at Iron Creek Campground with NF 99 northeast of Spirit Lake. This roadway has a low design speed with sharp curves and narrow shoulders and turnouts for passing vehicles.

Traffic Volumes

Existing traffic volume information in the vicinity of the study area was obtained from WSDOT and the USFS. WSDOT provided existing PM peak hour and average daily traffic (ADT) volume information along U.S. 12, SR 504, and SR 503. The USFS provided ADT volume information at entrances and exits to the Mount St. Helens visitor centers along SR 504, as well as at various locations along national forest roads around Mount St. Helens. The traffic volume information obtained from WSDOT and USFS is summarized in Figures 2 through 9. For most locations, ADT and peak hour traffic volumes were available; however, for some locations only peak hour volumes were available and for other locations turning movement volumes were not available. In addition, traffic volume information for certain years were not available. Therefore, the roadway descriptions below denote traffic volumes for different years. The figures are annotated to indicate such data gaps.

U.S. 12

Figures 2 through 4 illustrate existing traffic volumes along U.S. 12. As shown in Figure 2, the I-5/U.S. 12 interchange ramps carry between approximately 70 and 370 vehicles during the PM peak hour, with the highest demand occurring on the southbound off-ramp. Traffic volumes at the following locations along U.S. 12 (listed from west to east) are illustrated in Figures 3 through 4:

- Tucker Road near Ethel
- Fuller Road near Salkum
- SR 122 near Silver Creek
- Beach Road between Silver Creek and Mossyrock
- Kehoe Road near Randle

As shown in the figures, the traffic volumes along U.S. 12 generally decrease from west to the east. The 1999 ADT volumes on U.S. 12 at I-5 were approximately 6,400 vehicles, whereas 1999 ADT volumes at Kehoe Road east of Randle were approximately 3,800 vehicles.

SR 504

Figures 5 through 7 illustrate existing traffic volumes along SR 504. As shown in Figure 5, traffic volumes at the I-5/SR 504 interchange range from approximately 160 to 400 vehicles during the PM peak hour, with the south ramps carrying more traffic than the north ramps.

Traffic volumes at the following locations along SR 504 (listed from west to east) are illustrated in Figures 5 through 7:

- Old Pacific Hwy./Dougherty Road near I-5
- Hall Road near Toutle
- SR 505 between Toutle and Kid Valley
- 1900 North near Kid Valley
- Northfork Viewpoint
- SR 504 Wye at the Coldwater Complex

The 1995 ADT volumes on SR 504 at I-5 were approximately 8,300 vehicles. The 1999 ADT volumes at the Coldwater Complex were approximately 1,200 vehicles.

SR 503

Figure 8 illustrates existing traffic volumes along SR 503 (east/west segment) near the I-5 interchange. Figure 9 illustrates existing traffic volumes along SR 503 (north/south segment) near the City of Battle Ground. Traffic volumes at the following locations along SR 503 (listed from west to east) are illustrated in Figures 8 and 9:

SR 503 (east/west segment)

- Lewis River Hwy. near Woodland
- Gun Club Road near Woodland
- Woodland Elementary

SR 503 (north/south segment)

- SR 502/Main Street in Battle Ground
- NW Onsdorff Road near Battle Ground
- NE 244th Street near Battle Ground
- Gabriel Road north of Battle Ground

The 1998 ADT volumes on SR 503 at I-5 were approximately 17,300 vehicles. The 1998 ADT volumes at the SR 502 intersection with SR 503 in the City of Battle Ground were approximately 16,300 vehicles.

NF 99

The 1999 ADT volume along NF 99 approximately one-half mile west of NF 25 was 512. This ADT volume has increased approximately 15 percent over the past 5 years.

NF 81

The 1999 ADT volume along NF 81 approximately one-half mile north of Cougar was 135 vehicles.

NF 25 and NF 90

Traffic volume information for these facilities were not available.

Level-of-Service

Operations along the various roadways were evaluated using Level-of-Service (LOS) measurements that correspond to a letter from A through F. The following provides a brief explanation of the various levels for two-lane highway operations.

- LOS “A” is the best operating condition, indicating a very free flowing roadway where all motorists are able to drive at their desired speed and the passing frequency required for desired motorist's speeds has not reached a demanding level. Drivers would be delayed no more than 30 percent of the time by slow-moving vehicles.
- LOS “B” is in the range of stable flow. The level of comfort and convenience to the driver is somewhat less than LOS A, however driving conditions are still very good. Passing demand needed to maintain desired speeds is becoming significant. Drivers are delayed up to 45 percent of the time by slow-moving vehicles.
- LOS “C” marks the beginning of significant interference to an individual's flow caused by others in the traffic stream. There are noticeable increases in platoon formation, platoon size, and frequency of passing impediment. Percent time delays are up to 60 percent.
- LOS “D” represents the approaching of unstable traffic flow. Passing demand is very high, while passing capacity approaches zero. The percentage of time motorists are delayed approaches 75 percent.
- LOS “E” represents forced or breakdown traffic flow. LOS E is defined as traffic flow conditions having a percent delay of greater than 75 percent. Passing is virtually impossible and passing becomes intense when slower vehicles or other interruptions are encountered.
- LOS “F” operation represents heavily congested flow with traffic demand exceeding capacity. Volumes are higher than capacity and speeds are below capacity speed.

The following provides a brief explanation of the various levels for signalized intersections.

- LOS “A” describes operations with very low signal delay with up to 10 seconds per vehicle. Most vehicles do not stop at the traffic signal.
- LOS “B” describes operations with signal delay greater than 10 seconds and up to 20 seconds per vehicle. More vehicles stop than LOS A, causing higher levels of average delay.
- LOS “C” describes operations with signal delay greater than 20 seconds and up to 35 seconds per vehicle. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
- LOS “D” describes operations with signal delay greater than 35 seconds up to 55 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual signal cycle failures are noticeable.
- LOS “E” describes operations with signal delay greater than 55 seconds and up to 80 seconds per vehicle. This level is considered by many agencies to be the limit of acceptable delay.
- LOS “F” describes operations with signal delay in excess of 80 seconds per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection.

The LOS analysis for the study area roadways was based on procedures outlined in the *Highway Capacity Manual* (HCM) published by the Transportation Research Board (TRB). The computer software used in analyzing two-lane highway operations and signalized intersections is the industry standard, *Highway Capacity Software* (HCS). This software is used throughout the country for evaluating traffic operations.

Table 1 summarizes the existing ADT and PM peak hour volumes and provides the PM peak hour LOS for the two-lane highways (U.S. 12, SR 504, and SR 503) west of and east of the intersections identified in the previous section.

Table 2 summarizes the existing LOS at the indicated intersections. Appendix A contains the Highway Capacity Software (HCS) printouts of the LOS calculations.

Table 1
Level of Service
Two-Lane Highway – Existing Conditions

<i>Intersection</i>	<i>ADT Volume</i>		<i>PM Peak Volume</i>		<i>Level of Service</i>	
U.S. 12 and	<i>West of...</i>	<i>East of...</i>	<i>West of...</i>	<i>East of...</i>	<i>West of...</i>	<i>East of...</i>
SB I-5 Off/On Ramp (1999)	4,210	6,420	360	560	B	C
NB I-5 Off/On Ramp (1999)	6,420	9,200	560	825	C	D
Tucker Road (1999)	6,630	7,200	645	735	D	D
Fuller Road (1999)	6,510	6,250	720	690	D	D
SR 122 (1999)	6,460	6,020	720	660	D	D
Beach Road (2000)	5,470	5,760	775	800	D	D
Kehoe Road (1999)	4,090	3,820	460	420	C	C
SR 504 and	<i>West of...</i>	<i>East of...</i>	<i>West of...</i>	<i>East of...</i>	<i>West of...</i>	<i>East of...</i>
SB I-5 Off/On Ramp* (1995)	5,380	8,300	680	925	C	D
NB I-5 Off/On Ramp* (1995)	8,300	11,810	925	1,245	D	D
Old Pacific Hwy/Dougherty Road* (1995)	11,810	9,420	1,245	1,035	D	D
Hall Road (1999)	4,180	3,800	540	485	C	C
SR 505 (1999)	1,840	1,890	390	395	C	C
1900 North (1996)	2,110	2,080	405	385	C	C
Northfork Viewpoint (1999)	1,350	1,340	225	235	B	B
SR 504 Wye at Coldwater Complex (1999)	1,040	1,240	305	350	B	C
SR 503 (South) and	<i>North of..</i>	<i>South of..</i>	<i>North of..</i>	<i>South of..</i>	<i>North of..</i>	<i>South of..</i>
SR 502/Main Street* (1998)	14,070	16,300	1,435	1,600	E	E
NW Onsdorff Road* (1999)	13,930	15,670	1,475	1,615	E	E
NE 244 th Street* (1998)	12,260	12,200	1,440	1,410	D	D
Gabriel Road (1998)	6,600	9,300	590	820	C	D
SR 503 (North) and	<i>West of...</i>	<i>East of...</i>	<i>West of...</i>	<i>East of...</i>	<i>West of...</i>	<i>East of...</i>
Woodland Elementary (1998)	5,890	5,580	560	550	C	C
Gun Club Road (1998)	8,610	7,020	785	595	D	C
Lewis River Highway* (1998)	17,260	14,400	1,550	1,365	E	D

* These segments are in urban (developed) areas with multiple lanes or left turn lanes.

Table 2
Level of Service
Signalized Intersection – Existing Conditions

<i>Intersection</i>	<i>PM Peak Hour Level of Service</i>
SR 504 and	
SB I-5 Off/On Ramp	C
NB I-5 Off/On Ramp	C
Old Pacific Highway	C
SR 503 and	
SR 502	*
NE 244 th St.	D
Lewis River Highway	C
NB I-5 Off/On Ramp	*

* Turning movements were not available at these intersections.

As shown in Table 1, most of the segments along the roadways in the vicinity of Mount St. Helens operate with Levels-of-Service ranging between LOS “B” and “D”. There are some segments, however, that operate with a LOS “E”. These segments are primarily located within the Cities of Woodland and Battle Ground, which are generally urban areas. The two-lane highway module of the HCS is more applicable to rural conditions. Consequently, these segments may be experiencing a better LOS than indicated.

A better indication of how these urban segments are operating is provided in Table 2. Table 2 indicates that the signalized intersections, in the urban areas, are operating at acceptable levels of “C” and “D”. A more detailed traffic analysis of these urban segments could be conducted in a later phase of the study.

Future Conditions

Transportation System Changes

The alternatives considered in this traffic analysis for the SR 504 Feasibility Study are presented in Figure 1. Except for these proposed roadway corridors, there are no known transportation system improvements in the study area that would affect the analysis.

Derivation of Future Traffic Volumes

Using the existing traffic volumes as a base, future (year 2020) traffic volumes were developed to determine the traffic impact that each of the alternative corridor connections would have on the existing roadway network. Population projections and tourism forecasts were used to compute traffic volumes for the year 2020.

Population Projections

Population projections were obtained from the Washington State Office of Financial Management (OFM) for Lewis, Cowlitz, Clark, Skamania and Yakima counties. The OFM develops population projections using high, medium, and low growth rates. This traffic analysis assumed that the five counties would experience a medium population growth rate from 2000 to 2020. OFM’s medium population growth rate for the five counties during that period is approximately 1.8 percent per year. For comparison, the projected King County annual population growth rate is 1.0 percent. The 1.8 percent annual growth rate projections for the five counties yield a total growth of 43 percent over the 20-year period from 2000 to 2020.

Applying the 43 percent growth rate to the existing traffic volumes represents background traffic growth. This traffic volume is the increase in traffic due to population increases and does not account for transportation improvements. Adding this projected increase in traffic volume to the existing traffic volumes represents the future no-build scenario.

Tourism Forecasts

It is anticipated that tourism to Mount St. Helens National Volcanic Monument would increase if SR 504 were connected to state and federal roads on the eastern side of the National Monument. Based on existing visitor records at Mount Rainer National Park and Mount St. Helens National Volcanic Monument, estimates were developed projecting the volume of traffic that would use the connection to visit both areas during the same trip.

Visitor records at Mount Rainer indicate that approximately 400,000 vehicles enter the park during the three summer months of June, July, and August. Tourism related traffic would be considerably lower during the winter months when tourism is at its lowest. A breakdown of the entry points by which visitors enter the Mount Rainer National Park indicates that approximately 50 percent of the visitors enter at the Nisqually Entrance on SR 706, and approximately 25 percent of the visitors enter at the Sunrise Entrance on SR 410 and 25 percent at the Stevens Canyon Entrance on SR 123. Since Mount St. Helens National Volcanic Monument is not a national park and it has no dedicated entrances, traffic volume information was obtained at the entrances/exits to the visitor centers along SR 504. Traffic volume information at the Silver Lake, Coldwater Complex, and Johnston Ridge visitor centers indicate that approximately 60,000 to 75,000 vehicles enter each of these visitor centers during the same three-month period (June through August). The growth rates for vehicles entering Mount Rainer National Park and Mount St. Helens National Volcanic Monument have stayed fairly level over the past 5 years and are expected to increase only slightly over the next 20 years.

Because of the indirect route to get from Mount Rainer National Park and Mount St. Helens National Volcanic Monument, the percentage of visitors that currently visit both areas on the same trip is expected to be very low. A connection from U.S. 12 or NF 25 to SR 504 would provide a much more direct route between these areas and increase accessibility to Mount St. Helens National Volcanic Monument, which would result in additional traffic on U.S. 12 and SR 504. In order to determine how the SR 504 connection to the eastern side of Mount St. Helens would affect tourism and traffic, the following factors were considered:

- Visitor Composition – Based on a recent survey conducted for Mount Rainier National Park, most of the visitors to the park are in-state residents (approximately 60 percent). Furthermore, 44 percent of the visitors are from local counties (King, Lewis, Pierce, and Yakima).
- Time Constraints – It was also determined from the survey that over 75 percent of the respondents stayed at Mount Rainier National Park less than one day and two-thirds stayed less than 7 hours.
- Lack of Accommodations – There are very few hotels in the vicinity of both Mount Rainier National Park and Mount St. Helens National Volcanic Monument and along U.S. 12.

Assuming that the visitor composition and time constraints associated with Mount Rainier National Park would be similar to those of Mount St. Helens National Volcanic Monument because of their proximity, the types of visitors to both areas are primarily local (or in-state) residents that spend less than one day at each location. These factors indicate that many of the visitors to Mount Rainier are having one-day “get-aways” and would not have the time to visit both Mount Rainier and Mount St. Helens in the same trip. The lack of accommodations in the area further suggests that the likelihood of visitors visiting both of these areas in the same trip would be low. Based on the assumption that approximately 44 percent of Mount Rainier and Mount St. Helens visitors are local residents, it was estimated that approximately one fourth to one third of those local residents (i.e., 10 to 15 percent of the total volume of visitors to both sites) would use a road connection to Mount St. Helens from the east. With most of the population centers to the north, south, and west of Mount St. Helens, this was a conservative estimate.

Assuming 10 to 15 percent of the traffic currently traveling to Mount St. Helens and Mount Rainier would use a connection between SR 504 and the eastern side of Mount St. Helens, approximately 500 to 800 vehicles would travel in both directions between Mount St. Helens and Mount Rainier on a daily basis during the peak summer months of June, July, and August. This estimate is derived from the current traffic volumes visiting the areas; i.e., 475,000 vehicles over a 90-day period (June through August) divided by 90 days and multiplied by 10 to 15 percent. In addition to the traffic anticipated to use the SR 504 through route, it was assumed that the new connection to SR 504 would generate a 10 percent increase in tourism traffic (i.e., 10 percent of the estimated 500 to 800 vehicles attributed to using the new eastern connection to Mount St. Helens, or 50 to 80 additional vehicles) to/from the east on U.S. 12. Because traffic volume information at the Mount St. Helens visitor centers over the past 5 years reflects very little to no growth, the 10 percent increase generated by the Mount Rainier – Mount St. Helens connection is a conservative estimate. Therefore, the total maximum increase in tourism

traffic as a result of the SR 504 connection would be 550 to 880 vehicles per day. This conservative estimate does not account for other factors that may affect travel patterns, including gas prices, overall economic conditions, and local and regional marketing efforts. It also represents the maximum traffic pattern during peak tourism season. Winter traffic volumes presumably would be much less.

Figure 10 provides the tourism related traffic volumes between Mount Rainer and Mount St. Helens for the three general corridor scenarios (i.e., SR 504 connection to the north/northeast, east, and south). As shown in Figure 10, the north/northeastern corridor (Options 1 through 10 as described in Technical Memorandum No. 1) would most likely experience the maximum amount of anticipated traffic on the SR 504 connection (i.e., 550 to 880 vehicles per day during the summer months) because it would be most convenient to tourists traveling between Mount Rainier National Park and Mount St. Helens National Volcanic Monument. The eastern and southern corridors (Options 11 through 14 as described in Technical Memorandum No. 1) would have less tourism traffic because they would require significantly more travel on NF 25 and or NF 90, and therefore significantly more time to connect with SR 504. The Elasticity of Demand theory states that increases in time required for travel results in decreases in the percentage of travelers willing to take the trip due to the additional time. For the eastern corridor connection, only 70 to 75 percent of the maximum amount of tourism traffic was assumed and, for the southern corridor connection, only 50 percent of the maximum amount of tourism traffic was assumed (i.e., 400 to 700 vehicles for the eastern connection and 250 to 450 vehicles for the southern connection).

Another tourist attraction in Southeast Washington is the Columbia River Gorge. With a new connection to Mount St. Helens from the eastern or southern side of the monument and the relatively close distance from the Gorge area to Mount St. Helens, there is the potential for tourism related traffic between the Gorge and Mount St. Helens. The most direct route between the Gorge and Mount St. Helens would be to use Wind River Highway from SR 14 near the City of Carson to NF 90. From there, tourists could use either NF 25 if the new connection were on the eastern side of the monument or NF 90 if the new connection were on the southern side of the monument. Because the roadways connecting the Gorge and Mount St. Helens are secondary routes with lower design speeds and the volume of tourists visiting the Gorge is considerably less than those visiting Mount Rainer, the volume of tourism traffic projected between the Gorge and Mount St. Helens was estimated to be approximately 10 percent of the tourist traffic projected between Mount Rainer and Mount St. Helens. The percentage results in approximately 55 to 90 vehicles per day using the new connection either on the southern or eastern sides of Mount St. Helens. It is believed that a northern connection would not provide a

convenient route for tourists and the volume of traffic traveling on the Wind River Highway and NF 25 to the north side of Mount St. Helens and backtracking to the visitor centers would be negligible.

Analysis of Future Traffic Projections (Year 2020)

Future traffic volumes were developed based on the existing traffic volumes and the population and tourism projections discussed in the previous section. The analysis assumes a 1.8 percent annual growth rate of existing traffic volumes over a 20-year period (2000 to 2020) to reflect the increase in population and establish the background, or no-build conditions. Tourism related traffic volumes were added to the population-increased volumes to obtain the future traffic projections for the build scenario.

Because traffic patterns would vary depending on the build scenario, the traffic projections for the year 2020 were developed for three general corridor connections. The three corridors are as follows:

- North/northeastern connection – SR 504 connected with U.S. 12
- Eastern connection – SR 504 connected with NF 25
- Southern connection – SR 504 connected with SR 503/NF 90

For all three scenarios, the traffic volumes were increased by 43 percent to reflect medium population growth over a 20-year period (i.e., background). The traffic volume increases due to tourism were tailored, depending on the connection scenario, as described in the previous section. The three connection scenarios are discussed below in detail.

It should be noted that common to all three scenarios is the effect the roadway design speed and terrain can have on the future projections. Many of the assumptions used in projecting traffic volumes for the new connection are based on travel times. Studies have shown that as time required for travel increases the percentage of travelers willing to take the trip decreases due to the additional time. A lower design speed would likely have more and tighter radii curves, which would increase travel time through the corridor. A route with significant hills to climb and descend would also increase travel time, especially for trucks. As a result, a lower designed road would be less attractive for use as a bypass route.

North/Northeastern Connection

A roadway connecting SR 504 with U.S. 12 would provide a convenient link for tourists who are visiting Mount Rainer and also want to visit Mount St. Helens. The connection would also benefit tourists traveling to Mount St. Helens from the east on U.S. 12. To a lesser extent, the connection would provide an alternative route for non-tourists who are

passing through the region on their way to/from I-5. It was assumed, however, that this volume would be minimal and that the majority of these non-tourist travelers would continue on U.S. 12 rather than use SR 504 and the new connection. With a north/northeastern corridor connection, most of the traffic movements at the U.S. 12/SR 131 intersection in Randle would be east-west through trips.

As shown in Figure 10, there are three suggested locations for the connection to U.S. 12 and one northeastern connection to NF 25 (i.e., at Iron Creek Campground). The traffic estimates for a north/northeastern corridor connection are independent of the specific connection locations, and therefore are valid for all north/northeastern connection scenarios. The primary difference in the northern and northeastern connections would be the traffic movements at the U.S. 12/SR 131 intersection in Randle. The northeastern corridor connection from NF 25 would result in more turning movements at the intersection than the northern connections directly to U.S. 12.

Figures 11 through 16 provide the future (year 2020) traffic volumes for U.S. 12 and SR 504 based on a north/northeastern corridor connection. These figures reflect the population projections and the upper limit of the additional tourism traffic depicted in Figure 10. Note that the volumes in Figure 10 are Average Daily Traffic (ADT) volumes: these were converted to PM peak hour volumes for Figures 11 through 16 using a 10 percent peak hour factor.

Eastern Corridor Connection

The eastern corridor connection, similar to the north/northeastern corridor connection, would benefit tourists destined to Mount St. Helens from Mount Rainer and from the east; however, the connection would not provide much benefit for pass-through non-tourist travelers. The eastern connection would add approximately 400-700 additional vehicles per day during the peak summer months along NF 25. This additional traffic could be accommodated since existing traffic volumes along NF 25 are minimal. ADT volumes for NF 25 were not available; therefore, projections for future ADT on NF 25 could not be made in this analysis.

Southern Connection

A roadway connecting SR 504 with SR 503 would provide an alternate and more direct route for tourists visiting Mount St. Helens from populated areas to the south, such as Vancouver, Washington, and Portland, Oregon. Tourists travelling between Mount Rainer and Mount St. Helens would receive some benefit with a southern connection, since they would have an alternative to traveling on I-5, however the benefit would be considerably less than the benefit provided by a

north/northeastern or eastern connections. It was assumed that daily traffic along a southern connection would be approximately half of the daily traffic along the north/northeastern corridor.

Figures 17 through 18 provide the future (year 2020) traffic volumes for SR 503, which would be affected the most by a southern connection scenario. These figures reflect the population projections and the upper limit of the additional tourism traffic depicted in Figure 10. Note that the volumes in Figure 10 are Average Daily Traffic (ADT) volumes: these were converted to PM peak hour volumes for Figures 17 through 18 using a 10 percent peak hour factor.

Level of Service

Traffic volumes and LOS for peak future conditions (i.e., summer tourism season) are provided in Table 3. LOS for the signalized intersections are provided in Table 4. Appendix A contains the Highway Capacity Software printouts of the LOS calculations.

Table 3
Level of Service
Two-lane Highway – Future Conditions

<i>Intersection</i>	<i>ADT Volume</i>		<i>PM Peak Volume</i>		<i>Level of Service</i>	
U.S. 12 and	<i>West of ...</i>	<i>East of ...</i>	<i>West of ...</i>	<i>East of ...</i>	<i>West of ...</i>	<i>East of ...</i>
SB I-5 Off/On Ramp	6,020	9,170	520	795	C	D
NB I-5 Off/On Ramp	9,170	13,160	795	1,175	D	D
Tucker Road	9,480	10,300	920	1,050	D	D
Fuller Road	9,310	8,940	1,025	985	D	D
SR 122	9,240	8,610	1,025	940	D	D
Beach Road	7,820	8,240	1,110	1,140	D	D
Kehoe Road	6,730	6,340	745	685	D	D
SR 504 and	<i>West of ...</i>	<i>East of ...</i>	<i>West of ...</i>	<i>East of ...</i>	<i>West of ...</i>	<i>East of ...</i>
SB I-5 Off/On Ramp*	7,690	11,870	970	1,325	D	D
NB I-5 Off/On Ramp*	11,870	16,890	1,325	1,780	D	E
Old Pacific Hwy/Dougherty Road*	16,890	13,470	1,780	1,480	E	E
Hall Road	5,980	5,430	775	695	D	D
SR 505	2,630	2,700	560	565	C	C
1900 North	3,020	2,970	575	555	C	C
Northfork Viewpoint	2,670	2,800	410	425	B	C
SR 504 Wye at Coldwater Complex	2,360	2,650	525	590	C	C
SR 503 (South) and	<i>North of...</i>	<i>South of...</i>	<i>North of...</i>	<i>South of...</i>	<i>North of...</i>	<i>South of...</i>
SR 502/Main Street*	20,120	23,310	2,050	2,290	E	E
NW Onsdorff Road*	19,920	22,410	2,110	2,300	E	E
NE 244 th Street*	17,530	17,450	2,060	2,015	E	E
Gabriel Road	9,440	13,300	845	1,170	D	D
SR 503 (North) and	<i>West of ...</i>	<i>East of ...</i>	<i>West of ...</i>	<i>East of ...</i>	<i>West of ...</i>	<i>East of ...</i>
Woodland Elementary	8,420	7,980	800	785	D	D
Gun Club Road	12,310	10,040	1,120	850	D	D
Lewis River Highway*	24,680	20,600	2,330	1,950	E	E

* These segments are in urban (developed) areas with multiple lanes or left turn lanes.

Note: The ADT volumes and LOS for U.S. 12 and SR 504 intersections assume a north/northeast connection, and the ADT volumes and LOS for SR 503 (north and south) assume a southern connection.

Table 4
Level of Service
Signalized Intersection – Future Conditions

<i>Intersection</i>	<i>PM Peak Hour Level of Service</i>
SR 504 and	
SB I-5 Off/On Ramp	C
NB I-5 Off/On Ramp	C
Old Pacific Highway	C
SR 503 and	
SR 502	*
NE 244 th St.	D
Lewis River Highway	C
NB I-5 Off/On Ramp	*

* Turning movements were not available at these intersections.

As shown in Table 3, most of the segments along the roadways in the vicinity of Mount St. Helens would operate with LOS “C” or “D”. There are some segments however, that operate with a LOS “E”. These segments are primarily located within urbanized areas. As noted previously, the two-lane highway module of the HCS is more applicable to rural conditions. Consequently, these segments may experience a better LOS in the future than indicated in this analysis.

One indication that these segments may experience a better LOS than indicated in Table 3 is the results provided in Table 4. This table shows that the signalized intersections, in the urban areas, will experience acceptable levels-of-service of “C” and “D” in the future. A more detailed traffic analysis of these urban segments could be conducted in a later phase of the study.

Concluding Remarks

The results of the traffic analyses provided in this technical memorandum indicate that a connection of SR 504 by any of the proposed future corridors could be accommodated from a traffic capacity standpoint. The traffic projections suggest that the north/northeastern corridor would provide the greatest benefit in terms of accessibility to Mount St. Helens National Volcanic Monument from U.S. 12 and Mount Rainier National Park and have the greatest effect on traffic along the SR 504 and U.S. 12 corridors. A north/northeastern corridor connection would generate more tourism traffic into and out of the National Monument.

The projections indicate that the LOS on all highways in the study area (U.S. 12, SR 504, and SR 503) would not be dramatically reduced with any of the proposed connections. For the most part, the roadways would maintain an acceptable LOS of at least “D,” with a few exceptions in the

urban areas, as noted in Tables 1 and 3. It should be noted that most of the reductions in LOS on the roadways are attributable to population or “background” growth that will happen regardless of whether a connection from SR 504 is constructed or not.

Based on this traffic analysis, any connection between SR 504 and roadways to the north, east, or south would not have a significant detrimental effect on the surrounding roadway system.

Appendix A

Level-of-Service Calculation Results